Tube Box Upgrade

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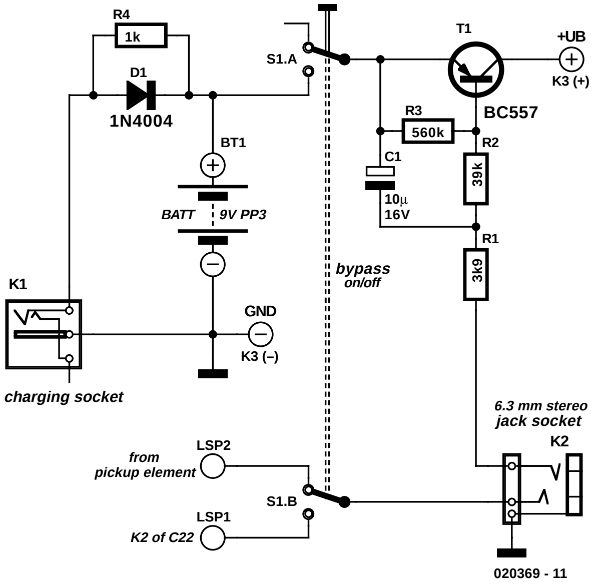

The Tube Box published in the June 2002 issue of *Elektor Electronics* opens up many new expressive sonic possibilities for the electric guitarist. The Tube Box can replace Hall, Echo, Pitch Shift, Phaser and the like: it offers so many possibilities that you may not need any other effects units.

The author has adapted and extended the Tube Box circuit, building it into the existing electronics compartment of a guitar. What was missing was the ability automatically to switch the unit on when the jack is plugged in. The usual method used in effects units is to connect one battery terminal to the middle pin of a stereo jack socket and so connect that terminal to ground when the jack is inserted, thus switching on the power to the circuit. This method cannot be used here, however, because ground in the Tube Box circuit is not connected directly to the battery. The small additional circuit shown here solves that problem by switching the supply voltage as the jack is inserted using a transistor, connected as a switch. The battery, a 9 V PP3 type, is fitted inside the guitar and powers the circuit. The negative terminal is connected to K3 while the positive terminal is taken to transistor T1 via an optional bypass switch. If no cable is plugged in the transistor is turned off. Only a tiny current (in the region of a few microamps) flows.

If a cable is now plugged in, a small current flows through R1, R2 and the internal resistance of the Tube Box circuitry, turning on T1. T1 goes into saturation. C1 prevents interference from mechanical contact noise on the jack socket as well as when the circuit switches on and off.

The bypass switch can be connected in a different way from the original circuit, namely directly between the pickup and the jack socket. This is a particularly good idea for stage use, since it means that in case of ‘emergency’ (severe interference or a flat battery) one can still play without the Tube Box circuit. In the ‘bypass’ position the battery is disconnected and the signal from the pickup appears directly on the output socket. With the switch in the ‘on’ position, the output signal comes from K2 of the Tube Box circuit. The input to the Tube Box circuit is in any case connected directly to the pickup.

In the author’s case the ‘original’ signal that appeared on the output jack of the instrument before it was modified was used. The tone control capacitors (in parallel with the pickups via a potentiometer) are removed. Instead, the three new potentiometers are fitted to the guitar. The following controls:

- the potentiometers for each of the two pickups (to control the mixing of the signals)
- the switch to select between the two pickups, or to switch them in parallel

remain connected as before, whereas the following are new:

- bypass/on switch
- Tube Box tone switch
- Tube Box ‘Mid Cut/Boost’ switch (existing ‘tone’ switch can be used)
- Tube Box drive control potentiometer
- Tube Box volume control potentiometer
- Tube Box tone control potentiometer

A file containing photographs of the modifications made to the author’s guitar can be downloaded from www.elektor-electronics.co.uk/dl/dl.htm, reference number **020369-11**, under month of publication of this article. Great care was taken in construction to ensure adequate shielding. Self-adhesive copper foil (available, for example, from Conrad Electronics) was used and the enclosure for the electronics was completely screened, the individual pieces of copper foil being soldered together. This is very important, as the Tube Box has a high gain and is very sensitive to external interference. Conductive spray can also be used around the switches, potentiometers and pickups: the effort is definitely worthwhile.

D1 and R4 are provided to connect the battery to the outside world. The battery can be charged via connector X1 and D1. R4 allows the battery voltage to be measured without having to dismantle the instrument. D1 and R4 prevent a short on X1 from damaging the battery. An old mains adaptor can be used as a charger: a 150 mAh battery can be charged at around 20 mA.

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